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MARK E. FEJER
GAS TECHNOLOGY INSTITUTE
1700 SOUTH MOUNT PROSPECT ROAD
DES PLAINES, IL 60018

EXAMINER	
CHU, HELEN OK	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/642,852	FAN, QINBAI	
	Examiner	Art Unit	
	Helen O. Chu	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 October 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) *15-39* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14, 40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's Arguments/Remarks have been received on October 11,2007.

2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action.

Claim Rejections - 35 USC § 112

3. The rejections under 35 U.S.C 112, second paragraph, on claims 1-14 are withdrawn because Applicant's amended the specification.

Claim Rejections - 35 USC § 103

4. The rejections under 35 U.S.C 103(a) as unpatentable by Srinivas in view of Tripathy on claims 1-14 are maintained. The rejection is repeated below for convenience.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-14 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Srinivas (US Publication 2004/0110051 A1) in view of Tripathy et al. (US Publication 2002/0183470 A1)

In regard to claims 1-11, 40, the Srinivas reference discloses a fuel cell with an anode catalyst layer comprising a proton conductive material made of sulfonic acid (Paragraph 22). The Srinivas reference discloses a grafted sulfonated polyaniline and a polypyrrole ionomer that is electrically conductive and dispersed throughout a carbon support in fuel cell catalysts (Paragraph 41 and Paragraph 30), however, the Srinivas reference does not disclose a material comprising lignin. The Tripathy et al. reference discloses the use of another form of polyaniline, or more specifically, polyaniline-lignin sulfonate complexes (Paragraph 25) which are used as proton conducting polymers (polyelectrolyte) disposed on electrically charged substrates (Paragraph 11) in a variety of electrochemical devices. The polyaniline-lignin sulfonated complex is known for use as a proton conducting material (Example 4). The Tripathy reference further disclose these polyaniline-lignin sulfonate complexes are water soluble virtually eliminating the need for toxic reagents and solvents, and thus creating an environmentally friendly synthesis (Paragraph 14), therefore it would have been obvious to one of ordinary skill to place proton conductive polymers such as polyaniline-lignin sulfonate complexes disclosed by Tripathy into electrochemical device such as the fuel cell; the fuel cell utilizes a sulfonated polyaniline catalyst layer as disclosed by Srinivas in order to create a light weight electrochemical cell without environmental hazards. It is well known in the art that a PEM fuel cell is an electrochemical device having an anode, a cathode and a proton exchange membrane electrolyte. One of skill would have been motivated to use the polyaniline-lignin sulfonate complex of Tripathy for the grafted sulfonated polyaniline polyelectrolyte of Srinivas because Tripathy teaches such complexes are known for use

as proton conductive materials disposed an electrically conductive substrate and are environmentally friendly.

In regards to claim 12, the Srinivas reference discloses a proton exchange membrane electrolyte with a thickness of 50-175 μm (Paragraph 17).

In regards to claim 13, the Srinivas reference discloses a catalyst layer that comprises platinum from Johnson Matthey (Paragraph 28) with a combination of ruthenium (Paragraph 146) and has a loading 0.15 mg/cm^2 (Paragraph 163).

In regards to claim 14, the Srinivas reference discloses the sulfonated group per monomer unit on the polymer ranges from 0.2- 2.9 (Paragraph 140).

Response to Arguments

7. Applicant's arguments filed October 11, 2007 have been fully considered but they are not persuasive.

Applicant's principal arguments are:

A) Regarding the first of these issues, the Examiner withdrew the rejection. Regarding the second of these issues, in light of MPEP §608.01(m) relating to the patentability weight to be given to the preamble of a Jepson claim, the Examiner agreed that all of the elements of the preamble of the rejected independent claims would be given patentable weight.

B) the primary reference on the basis that the material taught by the secondary reference is an electron and proton conductive material, notwithstanding the fact that it contains a component, i.e. lignin, which is not shown by either the primary or secondary reference to be suitable for use in a fuel cell.

C) It was also the position of the Examiner that direct methanol fuel cells, in which the fuel is methanol, are structurally equivalent to polymer electrolyte membrane fuel cells in which the fuel is hydrogen such that teachings relating to the structure of the latter are applicable to the former. No agreement was reached on this latter issue

D) "the Srinivas publication neither teaches nor suggests an anode catalyst comprising lignin as claimed by the Applicant...nowhere does the Tripathy et al. publication teach the use of electrically conductive polymers comprising lignin in fuel cells....no where does the Tripathy et al. publication teach or suggest the use of a lignosulfonate-Pani complex as part of an anode catalyst layer which is both proton Electron conductive employed in a fuel cell as claimed by the Applicant.

E) Claim 14 of the subject application states:" A fuel cell in accordance with Claim 1, wherein said electron conductive material comprises in a range of about 5% by weight to about 20% by weight of said anode catalyst layer."

The Examiner argues that this limitation is met by the teachings of paragraph [0136] of the Srinivas publication, which discloses the sulfonated group per monomer unit on the polymer ranges from 0.2-2.9. Applicant respectfully urges that nothing in therecitation of the Srinivas publication cited by the Examiner teaches a fuel cell having an anode catalyst layer in which the electron conductive material comprises in the range of about 5% to about 20% as claimed by Applicant

F) Other than the fact that sulfonated polyaniline-lignin is both electron and proton conductive, the Examiner has not articulated any motivation for the use of this material in the anode catalyst of a fuel cell.

G) In broad terms, the invention claimed by Applicant involves the use of an electron and proton conductive polymer comprising lignin for the purpose of improving the performance of polymer electrolyte membrane fuel cells with respect to increasing electron and proton conduction within the device, reducing methanol transport or crossover through the polymer electrolyte membrane of direct methanol fuel cells, improving corrosion resistance and adhesiveness as well as stability under oxidation and reduction conditions (Page 5, line 20 - Page 6, line 17 of the specification of the subject application). Applicant respectfully urges that the motivation articulated by the Examiner is not sufficient, particularly because it can be applied to virtually any electron and proton conductive polymer. That is, no motivation is articulated by the Examiner for the addition of lignin as claimed by Applicant to an electron and proton conductive material which is known to be suitable for use in polymer electrolyte membrane fuel cells. The Tripathy et al. publication teaches such a material, but neither teaches nor suggests any motivation for using this material in a fuel cell as claimed by Applicant. For example, there is no indication in the Tripathy et al. publication of improved electron and proton conductivity associated with this material nor is there any other indication of improvements to be derived from the use of this material in a fuel cell as claimed by Applicant, nor is there any indication of any other problem that would be solved by the use of this material in a fuel cell as claimed by Applicant

In response to Applicant's arguments, please consider the following:

A) the limitations of the preamble of the Jepson claim is admitted prior art. Claim 1 states " a fuel cell comprising an anode electrode, a cathode electrode and proton exchange membrane electrolyte disposes there between, the improvement comprising" in which the limitations before "improvement" is considered admitted prior art.

B) the secondary reference teaches and suggests use in electrochemical devices in which a fuel cell is an electrochemical device

C) the type of fuel does not limit the structure of the fuel cell. All fuel cells have an anode, a cathode and electrolytes.

D) The Applicants are arguing the Tripathy and Srinivas alone and not in combination of and therefore the Examiner acknowledges that the anode catalyst disclosed by Srinivas does not comprise lignin, otherwise claims 1-14 and 40 would be rejected under 102(e). The Srinivas does teach a fuel cell comprises an anode carbon supported catalyst (Paragraph 28) with platinum and sulfonated conducting polymer grafted onto the carbonaceous surface thereby increasing the electrical conductivity and electrical conductivity (Paragraph 30), the invention is particularly related to the applications of sulfonated conducting polymer-grafted carbons as conductive materials for fuel cell catalyst, particularly sulfonated polyaniline (Paragraph 41). The Tripathy reference supporting polyelectrolyte material in alternating fashion (Abstract). The polyelectrolyte is made of lignonsulfonated-Pani, an emerald form polyaniline (Example 4) which is electrically conducting and can be protonated (Paragraph 41). The Srinivas reference teaches a general teaching of sulfonated polyaniline catalyst support layer, the Tripathy reference teaches a particular from of sulfonated polyaniline (i.e.

lignonsulfonated-Pani) used as a conducting polymer for support of the catalyst. The argument made by the Examiner is that it would have been obvious to use polyanilines as broadly taught by the Srinivas as catalyst supports and that Tripathy teaches a form of polyanilines, specifically, polyaniline-lignin sulfonate complexes to be water soluble and more environmentally friendly and therefore substituting the two materials would have been obvious. It is also obvious to use the materials for the same purposes (i.e. as conductive polymers for catalyst supports) because anodes of ~~both~~ a fuel cell ~~and battery~~ are known to the art to require conducting materials. The confusion perhaps lies in the wording of the rejection and therefore the Examiner further clarified the Examiner's position. The anodes of both the fuel cell and battery are similar in that they both require conducting materials. As evidence by Sigma Aldrich, discloses a broad teaching of polyaniline are conducting polymers (upper left-hand corner) in which can be used in both fuel cell and battery (right tab). Please note that in citing Sigma Aldrich as evidence of inherency, the discussion found in MPEP 2124, Exception to the Rule That the Critical Reference Date Must Precede the Filing Date applies. That is, in certain circumstances, references cited to show a universal fact need not be available as prior art before applicant's filing date. In re Wilson, 31 1 F.2d 266, 135 USPQ 442 (CCPA 1962). Such facts include the characteristics and properties of a material or a scientific truism.

E) Paragraph 136 gives examples of molar ratios of the component in which one skilled in the art would be able to find the molecular weight by molar ratios, however, if the Applicants do not understand this teaching, please refer the Paragraph 140 where it

states that the sulfonated conducting polymer can be greater than about 0% to 100% by weight.

F) The Srinivas teaches a broad compound of sulfonated polyanilines for catalyst support in a fuel cell. The Tripathy et al. reference discloses a particular form of sulfonated polyaniline to be sulfonated polyaniline grafted lignin in which are polyelectrolytes used conductive material used in electrochemical devices . The anodes of both fuel cell and battery require conducting polymers and therefore it would have been obvious to one of ordinary skill in the art to interchange the two materials for the same purposes.

G) it appears to the Examiner that the Applicants are arguing the same arguments in various combinations. Applicants has not provided any experimental data to further illustrate the improvement of electron and proton conductivity over any prior art and therefore the Examiner is not persuaded by the Applicants specification.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Helen O. Chu whose telephone number is (571) 272-5162. The examiner can normally be reached on Monday-Friday 8am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HOC

TRACY DOVE
PRIMARY EXAMINER
12/07